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IST Capabilities Document for the ECS Project

Technical Paper

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RESPONSIBLE ENGINEER

Jim Creegan /s/ 9/26/95

Jim Creegan, FOS UI Supervisor September 1995
EOSDIS Core System Project

SUBMITTED BY

Cal E. Moore /s/ 9/26/95

Cal Moore, FOS Office Manager September 1995
EOSDIS Core System Project

Hughes Information Technology Corporation
Upper Marlboro, Maryland

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Abstract

The IST Capabilities Document was developed as a means to promote an "Instrumentor view" of the ECS FOS. It explains the functionality available to a PI/TL from the Instrument Support Terminal. It was first delivered in November 1994. This version (September 1995) is the last version of the document. The contents within will migrate into the FOS Users' Manuals, the first versions of which are to be delivered in September 1996.

Keywords: FOS, IST, CDR, IOT, PI/TL, instrument, capabilities, user, operations

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Abbreviations and Acronyms

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1. Introduction

1.1 Purpose

The Instrument Support Toolkit (IST) Capabilities Document has been written to provide a focal point to disseminate IST functionality, concepts and interfaces. The IST is being designed as an integrated entity of the FOS. From a design perspective, the IST capabilities are functionally similar to the EOC workstation capabilities with a few exceptions. However, there are unique operational characteristics associated with the IST due to the interface with the instrument operations teams associated with the distinct instruments. Thus, the objective of this document is to capture the capabilities, functionality, and key items associated with the IST in one document. This issue was identified and addressed in the System Design Review (SDR) RID #33.

This September 1995 version of the document is the last one that will be produced. The information contained within this document will be carried forward and updated in future volumes of DID 611/OP3, Operators' Manuals.

1.2 Organization

This paper is organized as follows:

Section 1 - Introduction	
Section 2 - Overview	Answers what is an IST. Talks about the IST pool concept.
Section 3 - Functionality	Descriptions of each function and tool available at the IST.
Section 4 - Interfaces	Describes the interfaces between the IST and the host computer.
Section 5 - Security	Discusses physical security, authorized users' lists, user authentication, and planning and scheduling lockout schemes.
Section 6 - Specifications	Describes the preliminary hardware specifications and the required COTS products.
Appendix A	Level 4 IST requirements. This appendix contains the trace table from the level 4 requirements which identifies the requirements that pertain to ISTs.
Abbreviations and Acronyms	

Please note that all screen displays are samples taken from prototypes and CDR screen designs and are subject to change during the development process.

1.3 Review and Approval

This White Paper is an informal document approved at the Office Manager level. It does not require formal Government review or approval; however, it is submitted with the intent that review and comments will be forthcoming.

The ideas expressed in this Working Paper are valid for September 1995; the concepts presented here are expected to migrate into the following formal CDRL deliveries:

Table 1-1. Working Paper to CDRL Migration

White Paper Section	CDRL DID/Document Number
3 - Functionality	604/OP1 - ECS Operations Concept Document 305/DV2 - Element Design Specification 611/OP3 - Operators' Manuals
5 - Security	304/DV1 - Segment/Element Requirements Specifications 305/DV2 - Element Design Specifications

Questions regarding technical information contained within this Paper should be addressed to the following ECS and/or GSFC contacts:

- ECS Contacts
  - Jim Creegan, FOS User Interface Supervisor, 301-925-0621, jcreegan@eos.hitc.com
- GSFC Contacts
  - Alan Johns, FOS Manager, 301-286-6602, ajohns@gsfcmail.nasa.gov

Questions concerning distribution or control of this document should be addressed to:

Data Management Office
The ECS Project Office
Hughes Information Technology Corporation
1616 McCormick Dr.
Upper Marlboro, MD 20774

2. Overview

An Instrument Support Toolkit (IST) is a collection of software executable programs that provide remote participation by ECS instrument teams in the scheduling, monitoring and analysis of their instruments. Using the IST, the Instrument Operations Team (IOT) can schedule, monitor real-time telemetry, monitor replay telemetry (including spacecraft recorded telemetry), perform analysis, build command procedures, submit command requests, monitor commanding, review ground scripts, submit table loads and microprocessor memory loads, browse and submit updates to the instrument databases, receive event messages, access documentation, send and receive electronic mail to and from other ISTs and the EOC, build customized telemetry displays, and receive context sensitive help. A requirements trace table is included in DID 304/DV1 (Requirements Specifications), which includes a column specifying the requirements that pertain to ISTs.

Since the IST is a collection of software that runs on PI/TL provided hardware, there will not be restrictions on the number of software packages for any one instrument team. To manage EOC resources, there will be a restriction on the number of ISTs that simultaneously can be logged in to the EOC. The number of simultaneous IST users is 15. There will be 10 dedicated simultaneous IST connections at the following locations:

CERES	4 at Langley
MODIS	2 at GSFC
MOPITT	1 at UofToronto, 1 at NCAR in Boulder
MISR	2 at JPL

In addition, 6 non-dedicated IST connections will be at the following locations:

CERES	4 at Langley
MODIS	1 at GSFC
MISR	1 at JPL

Other potential IST sites include Valley Forge (S/C developer) and Japan (ASTER).

The non-dedicated connections will be available on a first come-first served basis.

One additional constraint exists on IST usage. To submit database updates, command requests or table loads, the IST must be running in Management Mode. Any IST can run in Management Mode as long as the following conditions are met:

1. The IST user has the privilege to run in Management Mode, and

2. No other IST for that particular instrument is currently running in Management Mode.

These restrictions were suggested by instrument teams to help limit the number of people who can submit updates to the EOC. Also, operationally it is advantageous to have only one point of

contact for receiving command requests. The PI/TL will submit to the EOC a list of authorized users allowed to run the IST. This list will also include an indication as to which users may run the software in Management Mode.

Note that the restriction of submitting updates only in Management Mode does not apply to the planning and scheduling functions. There are built in features in the planning and scheduling Plan Window Manager that manage user access to the plan. The Plan Window Manager freezes the portion of the plan that a user has checked-out to update. "Frozen" portions of the plan are still available for all to read, but the update capability is limited to the user who has checked-out that portion.

3. Functionality

3.1 Environment

The IST user interface is implemented as a set of Motif-based window applications. Each display, or window, uses the standard Motif functions and is under the control of the Motif window manager. Therefore, a user will be able to manipulate the IST displays using the standard Motif windowing features (e.g., iconify, move, resize, etc.). In addition to the Motif features, the IST provides the following screen management capabilities:

3.1.1 Windows

The basic component of the IST user interface is the window. Each window is subject to the standard Motif actions (i.e., under the control of the Motif window manager). Several types of windows are used to display telemetry values (see section 3.4).

Two special windows, the Status window and the Control window, are always available to an IST user. A Status window, which is associated with a logical string (single telemetry stream), contains overall logical string status information (e.g., Universal Time Coordinated (UTC), spacecraft time, count down clock, current orbit number, etc.) and is updated dynamically. If a user workstation is connected to multiple logical strings, then multiple Status windows will be displayed. The Control window provides access to the rooms (see section 3.1.2), windows, and IST tools. The Control window also contains a directive input line that allows an IST user to enter directives. Each IST tool (e.g., Procedure Builder, Command Monitor, Event Analyzer, Time Line, etc.) is activated in a Motif-based window.

3.1.2 Rooms

The IST user interface consists of a series of rooms. Each room, which is made up of a collection of windows, is defined in a data base that contains the name of the room, the names of the windows in the room, and the position, size and state of each window. Each room has three configurations: default, tiled, and modified. The default configuration is defined by the user, stored in the data base, and is used when the room is initially activated. The tiled configuration, which is effected when the Tile button is selected, is used to "clean up" the user's desktop by repositioning and resizing the windows in the room as defined by the user. Typically, this function will be used to eliminate overlapping windows. The modified configuration is defined and set when the user modifies the room (e.g., adds a new window, changes the size or position of the windows, iconifies a window, etc.). When the user leaves the room and returns later, room is restored to the state it was in when the user left, by that default, tiled or modified. Figure 3.1-1 shows a representation of windows in a room, depicting a room's default and tiled states. As stated above, an IST user accesses a room from the Control window.

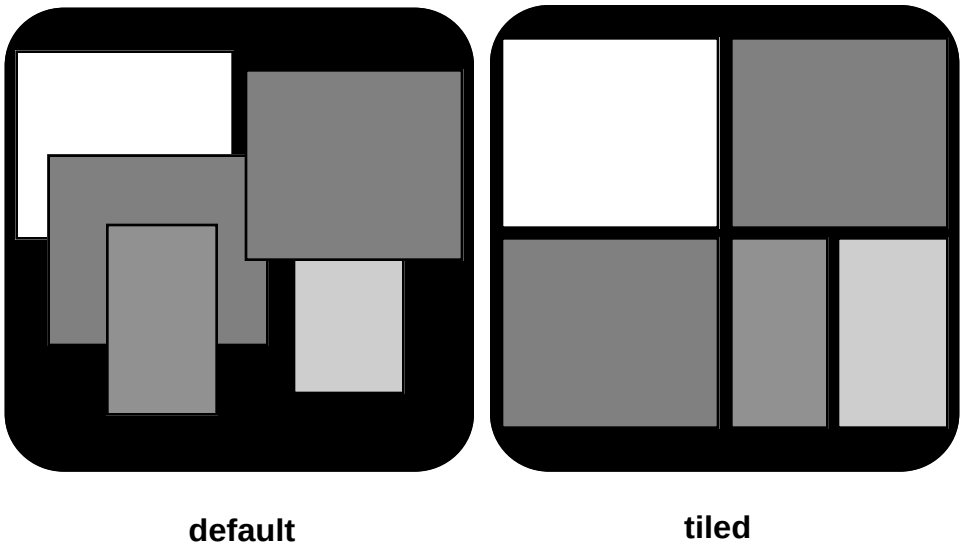

Figure 3.1-1. Sample Room Configurations

3.1.3 User Customization

The IST allows a user to customize the rooms and windows that make up the IST environment. These customization features include:

- setting the directories used for storage and retrieval of data,
- setting the destination(s) for screen snapshots,
- setting the default printer for print operations,
- setting the color intensities available within a real-time telemetry window (dynamic page),
- setting the colors used for Motif window components and attributes (i.e., window foreground, window background, window top shadow, and window bottom shadow colors),
- setting the font used by the user interface,
- setting the default rooms available from the Control window,
- defining a new room, and
- defining a new telemetry display window.

An IST user can select directories to be used for storing/retrieving room definitions, page definitions, screen snapshots, reports, and analysis products.

An IST user may also set the destination for a screen snapshot as a file, a printer, or to both.

An IST user can specify the default printer (from a list of printers available) for print operations that occur in the user interface.

An IST user can specify the font type (e.g., Helvetica) for various telemetry window attributes, including labels, mnemonics, and mnemonic values. A user can also specify the color intensity for real-time telemetry windows. This restriction is imposed to avoid possible confusion when viewing real-time telemetry data. A user may only specify the background, foreground, top shadow, and bottom shadow colors for non-real-time telemetry windows (selection will be from a palette of available choices per the ECS User Interface Style Guide).

An IST user may also create a new room definition. A user specifies the name of the room and the windows that will be included in the room. A user may employ an existing room definition to create the new room. During the room definition process, a user positions and sizes the windows for both the default and tiled configurations. Once the room definition is saved, the new room is accessed from the Control window in the same manner as the existing rooms.

An IST user may also create new telemetry display windows using the Display Builder tool. See section 3.9.4 for details.

3.2 Planning and Scheduling

The Planning and Scheduling system (P&S) provides users with a set of capabilities for performing scheduling of the EOS spacecraft, instruments and ground resources. The P&S has the objective of producing a conflict-free schedule of activities for each EOS spacecraft. Instrument inputs to the mission schedule may be sent to the EOC by a geographically separated groups of ISTs and external ICCs. The P&S subsystem integrates the instrument schedules with the spacecraft subsystem schedules to establish TDRSS contact times required to support the data volume needs of the instruments and allows the FOT to create a detailed activity schedule that is used for generation of ATC command loads and ground script.

During all phases of scheduling, P&S provides authorized users with a set of tools for schedule development and global schedule visualization, as shown in Figure 3.2-1. The P&S Timeline tool provides the Instrument Operations Team (IOT) at an IST with global visibility into planned operations of all EOS instruments and the spacecraft. The IOT may define activities for their instrument, and submit scheduling requests using these activities. The P&S ensures plan integrity using a Plan tool which manages the EOC Master plan and all user defined plans. The plan tool allows an authorized user to establish access for an instrument over a specific time period on a plan, and thus prohibits other users from concurrently modifying the same portion of the plan. P&S integrates scheduling modifications from an IOT with those of the other instruments and spacecraft subsystems, allowing the FOT to determine the TDRSS contacts needed to support the data volume needs of each instrument and identify any possible constraints. Before building the command load, he FOT tries to resolve any remaining constraints with the instrumenters; in case of an unresolved conflict, the Mission Operations Manager makes the final decision on its resolution.

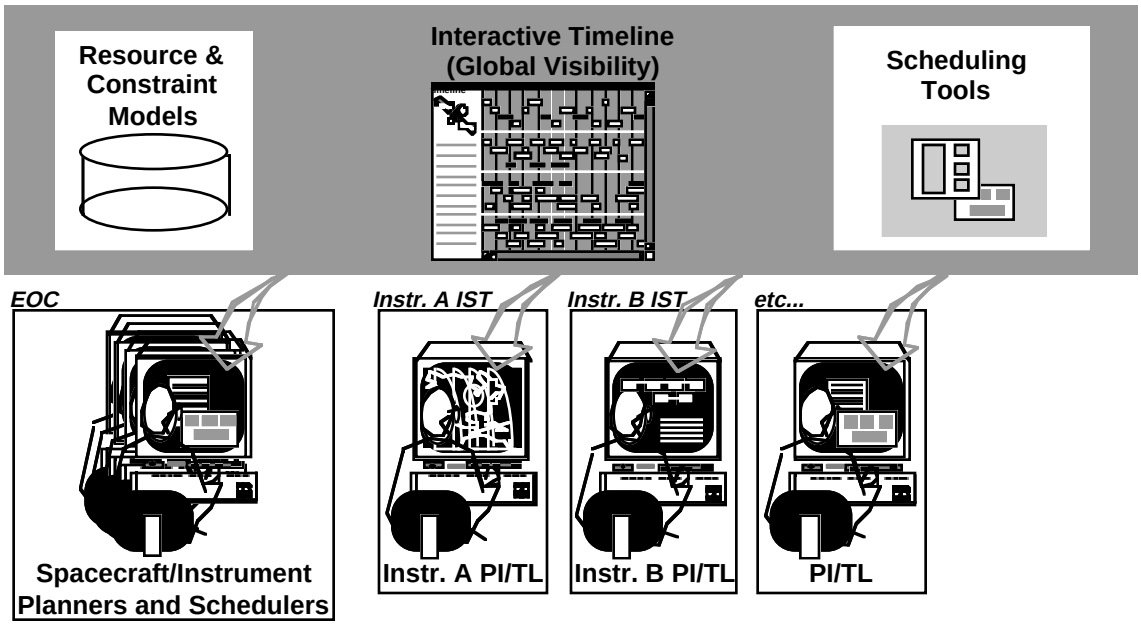

Figure 3.2-1. Common Set Of P & S Capabilities Provided To All FOS Elements (EOC and ISTs)

The planning and scheduling process is represented in figure 3.2-2, along with a general description of the IST-related scheduling functions described in each section. Note that the timing information provided in the following descriptions is an approximate estimate of the nominal operations scenario. In actual operations, the timing will have to be negotiated among the instrumenters and the FOT and may be documented elsewhere. The P&S tools that the IOT user will need to use in any scheduling phase are described in section 3.2.5.

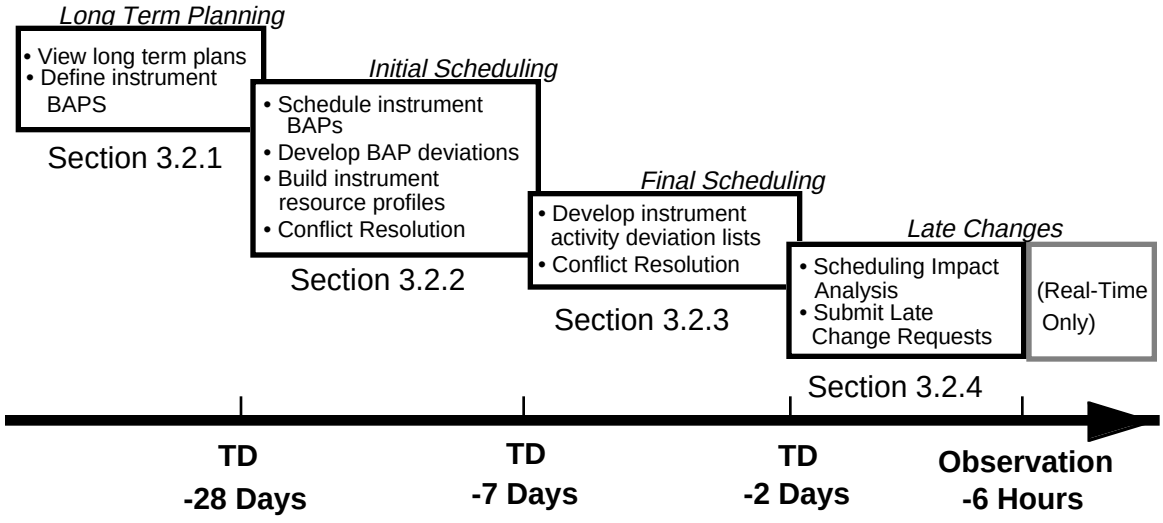

Figure 3.2-2. Timeline Of IST-Related Scheduling Functions

3.2.1 Long Term Planning

The EOC will provide the ISTs with the capability of viewing the contents of all long term plans. These plans outline information related to science objectives, instrument operations and subsystem operations over a five year duration. The Long Term Science Plan is developed by the Investigator Working Group and Project Scientist, defining the primary science objectives of the EOS spacecraft and instruments. Each instrument will have a Long Term Instrument Plan that outlines instrument-specific details on collections, maintenance and calibrations. Similarly, the Long Term Spacecraft Operations Plan will describe anticipated spacecraft subsystem operations and maintenance, along with forecast orbit maneuvers from the Flight Dynamics Facility. All the long term plans are stored in the EOC as ASCII free form text files. The ISTs may view all these long term plans to anticipate upcoming events, such as orbit maneuvers, before their execution. In addition, the long term plans provide the information necessary for defining instrument Baseline Activity Profiles (BAPs).

A BAP is a repetitive sequence of activities corresponding to normal instrument operations. Simple instruments will rarely deviate from their BAP, and their scheduling needs may be completely satisfied by their BAP definition. However, for complex instruments, the deviations may occur more frequently. In addition, true complex instruments will not have BAPs because their scheduled activities will significantly vary and may not be designed as a routine profile. The EOC will provide the Principal Investigators and Team Leaders at the ISTs with the capability of defining a set of activities and a set of BAPs. An IOT may define and store more than one BAP; a BAP may be defined for a certain repetitive activity sequence representing one set of needs. The BAP definer tool and activity definer tool which allow the IOT to define a BAP and an activity, are described later in sections 3.2.5.1 and 3.2.5.2 respectively. During initial scheduling, one of the BAPs can be used for creating the instrument's initial schedule.

3.2.2 Initial Scheduling

Initial scheduling begins approximately four weeks before the target week. The objective of initial scheduling is to provide the EOC with the necessary information for establishing TDRSS contact times. Based on a pre-negotiated basis, the IOTs or the FOT will schedule the instrument BAP for a specific period. Using their schedule visualization tools, the IOT determines if the BAP for the target week is acceptable. If adequate, all scheduling for the target week would be complete, and no further actions would need to be taken. However, a decision to modify the BAP may arise because of new data collection requirements and/or instrument maintenance activities. The IOT can schedule activity deviations to the BAP as needed. The PI/TL has an option to use an analysis plan (called a what-if plan) to schedule a BAP or activity deviations, check for constraints, try scheduling activities for different scenarios, and when satisfied, copy portions into the EOC Master plan. The P&S will check for constraints arising from any resource deviations and notify the FOT and the IOT via an event message.

The IOT participates in the scheduling process using the scheduling tools provided through their IST system. The P&S capabilities that will be available to the PI/TL include:

- global visibility into all instrument and subsystem schedules through a timeline display

  (Figure 3.2.2-1 shows an example of a timeline display for the CERES IST. Activities for the CERES FORE and CERES AFT instruments are displayed, along with a histogram plot for power usage and a line plot representing the amount of data volume in the Low Rate Recorder Buffer. The planned activities for the MODIS instrument and its data volume usage are also shown on the CERES IST timeline as an example of global visibility into the planned operations for other instruments.)

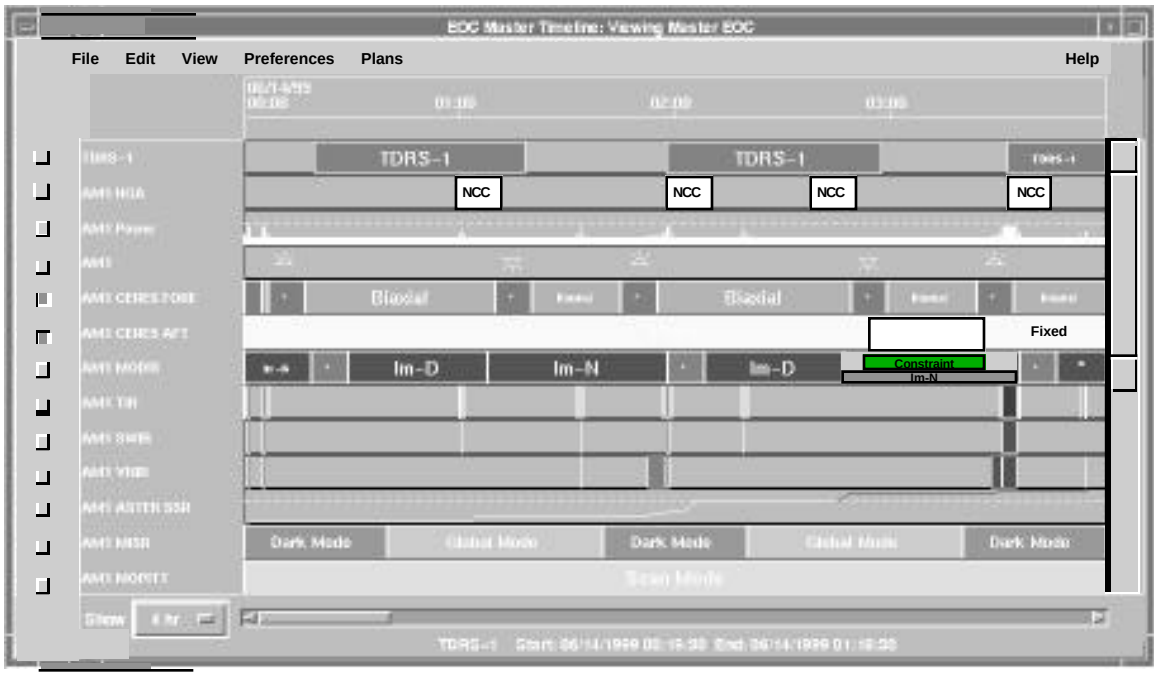

Figure 3.2.2-1. Example Of the CERES IST Timeline Display

- information pertaining to resource consumption over time (e.g. data volume, power)
- scheduling a BAP, if necessary
- scheduling deviations to their respective IST instrument

  (Figure 3.2.2-2 shows an example of an Activity Scheduler tool available to the CERES PI/TL for making schedule changes. The CERES PI/TL selects from the list of CERES activities, along with the desired scheduling time. When the "Allocate" button is pressed, the activity request is constraint checked and incorporated into the schedule. If constraints are detected, the CERES PI/TL will be notified for scheduling resolution.)

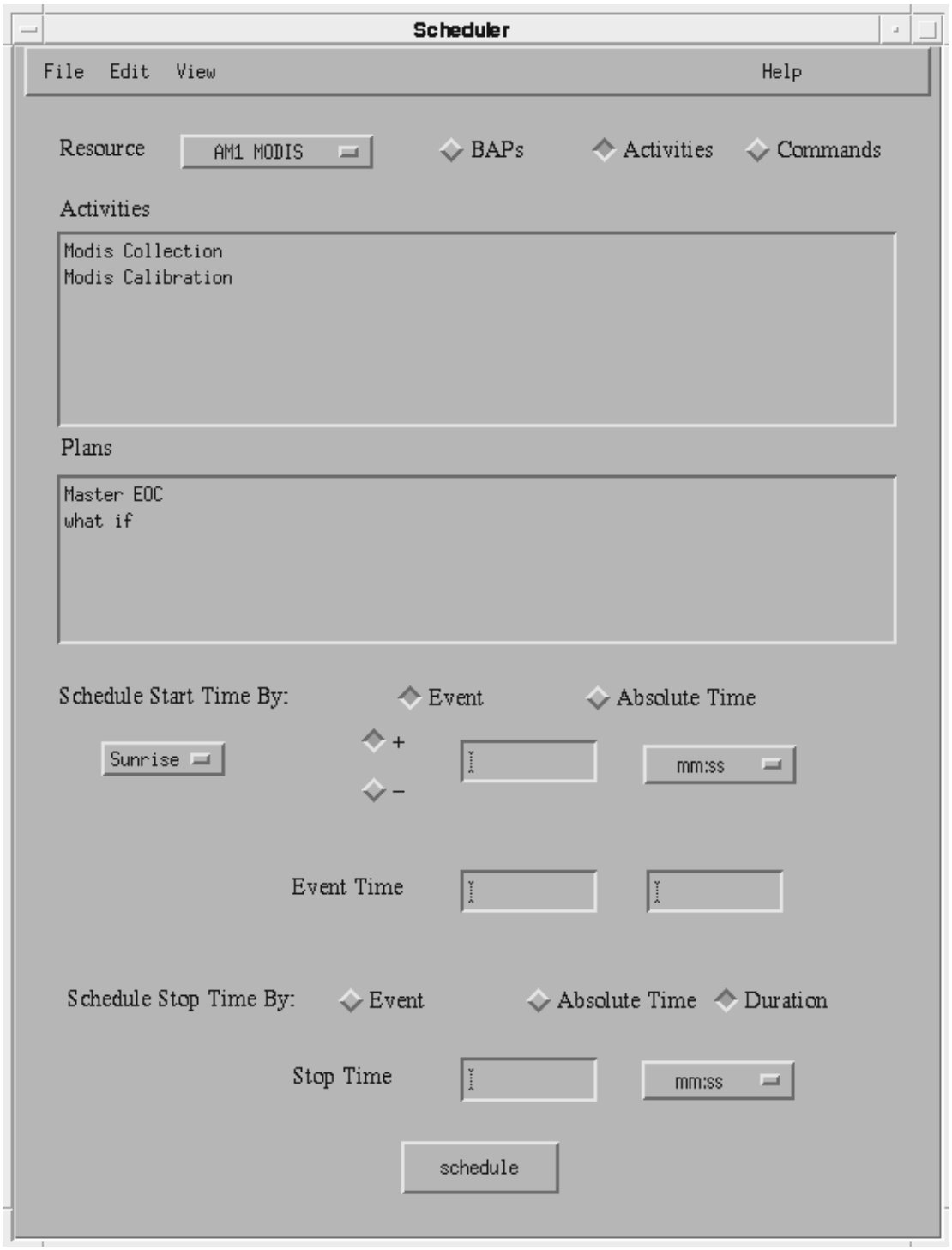

Figure 3.2.2-2. Example Of the CERES IST Activity Scheduler

- constraint checking and real-time notification of inter-instrument constraints
- "what-if" schedule development for scheduling analysis purposes

In addition, the EOC will provide the ISTs with planning aids generated by the Flight Dynamics Facility (FDF) to assist in schedule development. These planning aids, which include orbital events such as sunrise/sunset times, are generated as negotiated prior to launch. Based on varying needs, the planning aids may be generated at different time intervals (e.g. daily, weekly, or monthly). Whenever any FDF orbital information is received, the EOC makes the data available to the ISTs. The EOC also updates the schedules based on the new data received from FDF so that the schedules reflect more accurate predictions.

The EOC integrates the resource profiles from the instruments together to determine the overall spacecraft and instrument resource requirements for the target week. Based on these resource needs, the EOC determines the desired TDRSS contact times and submits them to the Network Control Center (NCC). If the requested times are not allocated by the NCC, the EOC may negotiate with the NCC for the best available TDRSS contact periods. Negotiations can take place until one week before the target week, when the NCC provides the active TDRSS schedule to the EOC.

Approximately one week before the target week, the EOC incorporates the TDRSS times confirmed by the NCC into the mission schedule, making it available to the ISTs. If the newly established TDRSS contact times cause any data volume constraints, notification of the conflict, along with a reason, is sent to the appropriate IST. During nominal planning and scheduling operations, data volume constraints are not expected to occur.

3.2.3 Final Scheduling

Between seven and two days before the target day, the final scheduling process takes place. During this time period, deviations to instrument schedules can be incorporated into the mission plan as long as they stay within the instrument's resource envelope. Normally, instrument scheduling will be completed during the initial scheduling phase and deviations will not be necessary. However, some short notice observations or maintenance activities may require a change to the planned operations.

As with initial scheduling, the IOT (or the EOC FOT) can schedule activity deviation on their instrument. The IOT will ensure that no constraints are violated as a result of the newly introduced activity. The IST system will provide the IOT with the same schedule visualization and schedule modification capabilities as described in section 1.2.

With the established TDRSS contact times, the PI/TL may use the IST system for scheduling the uplink window for a microprocessor load or table load. The uplink window may pertain to a specific TDRSS contact or span a longer duration (e.g. 24 hours). The EOC uses the scheduled uplink window for choosing an appropriate TDRSS contact. The PI/TL will be notified if a TDRSS contact can not be obtained that satisfies the uplink criteria.

Two days before the target day, the EOC integrates all the instrument and spacecraft activities to produce a conflict-free detailed activity schedule. During this process, any constrained activities

that still remain unresolved need to be removed from the mission schedule before a command load for uplink to the spacecraft can be generated. The FOT at the EOC tries to resolve constraints with the instrumenters; in case of conflict, the Mission Operations Manager makes the final decision on resolving the conflict.

3.2.4 Late Changes

Occasionally, late changes may need to take place after the detailed activity schedule is generated. Late changes occur due to mission anomalies, such as instrument problems. All instrument schedule changes that occur within 48 hours of the target day are subject to approval by the Project Scientist. Between 24 hours and 6 hours before an observation, a late change will be accepted for possible implementation if it does not affect previously scheduled activities; however, these times are based on worst-case timing requirements, and the EOC will attempt to be flexible whenever incorporating late changes. For scheduling the late change, the PI/TL at the IST interacts with the EOC in the same manner as described in initial scheduling and final scheduling (refer to sections 1.2 and 1.3).

3.2.5 P&S Tools

This section describes the scheduling tools provided at the IST as part of the P&S. The descriptions for the tools include the purpose, the method of activation, user interface screen samples, the input expected from the user, and the results. The user interface for all these tools is designed based on the X-windows standards, and provides a consistent look and feel for all displays.

3.2.5.1 Activity Definer

The activity definer tool is used by the IOT or the EOC FOT to define An activity is a logical command sequence that performs an action on an instrument or a spacecraft subsystem. An activity can change the mode of the an instrument or a spacecraft subsystem. In addition, modeling information such as power consumption and data rate may be associated with an activity. The activity definer tool can also be used for creating a new activity, editing a previously defined activity of simply for viewing it.

The Activity definer is used to define the following attributes of an activity: the ATC or ground script (ECL) commands with specific relative times, power consumption, data rate, mode transitions , and constraints.

The activity definer is brought up when the user selects this tool from the options within the "P&S room" provided by FOS User Interface subsystem (FUI). The sample screens for the Activity Definer tool are shown in Figures 3.2.5-1 through 3.2.5-7. The top level display always shows summary information about an activity as it is developed by the user on other displays. The "File" pull down menu on the top level screen provides the OPEN, NEW, SAVE, DELETE and QUIT functions, as applicable to activities. The tool validates information entered by the user. For example, the user can select commands from only the valid set of commands defined in the project data base. The entries in the time field are validated to ensure that the minutes and seconds are in the range 00-59. The command editor display allows the user to edit the activity

command list. The other displays allow the user to specify valid mode transitions, activity parameter values (integer, float, and discrete values), and constraints. When the user has specified all the activity definition parameters, the information can be saved. Before saving the activity, the tool checks for any internal constraints or inconsistencies within the activity and notifies the user. The user may then make the necessary changes to the activity definition. After review and approval, the data base administrator will add the activity to a configured list of activities in the project data base. An activity can be scheduled on any plan (EOC Master plan or a what-if plan) only after it is configured.

The constraint definer window is brought up when the user selects the constraints option from the options within the "P&S room" provided by FUI or from the activity Definer Top Level display.

The constraint definer window allows the user to define several type of constraints between an activity and another activity or an event. The constraint types include temporal constraints such as DURING, BEFORE, AFTER.

The user may specify basic Mode transition constraints for an instrument in the project data base. These may be further refined or restricted using this tool.

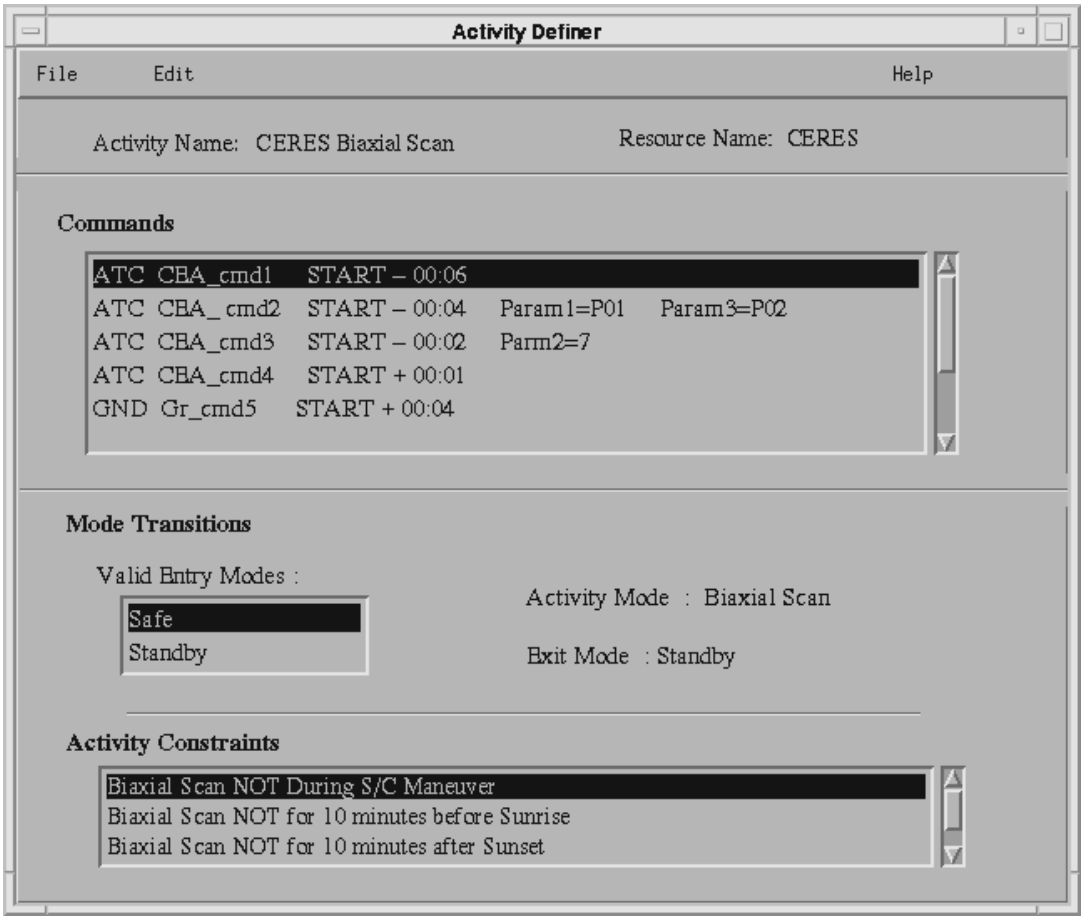

Figure 3.2.5-1. Activity Definer Top Level Display

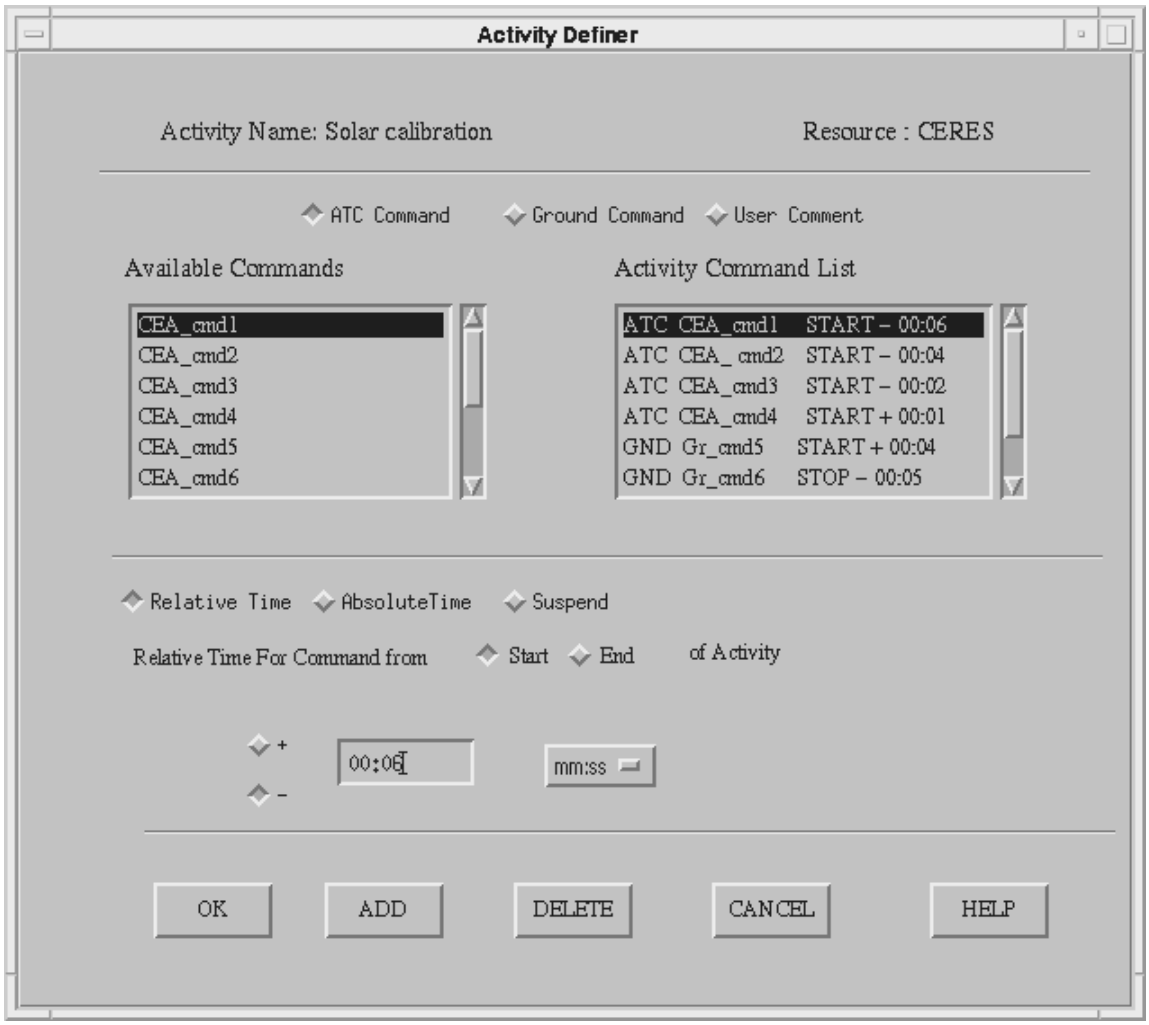

Figure 3.2.5-2. Activity Definer Command Editor Display

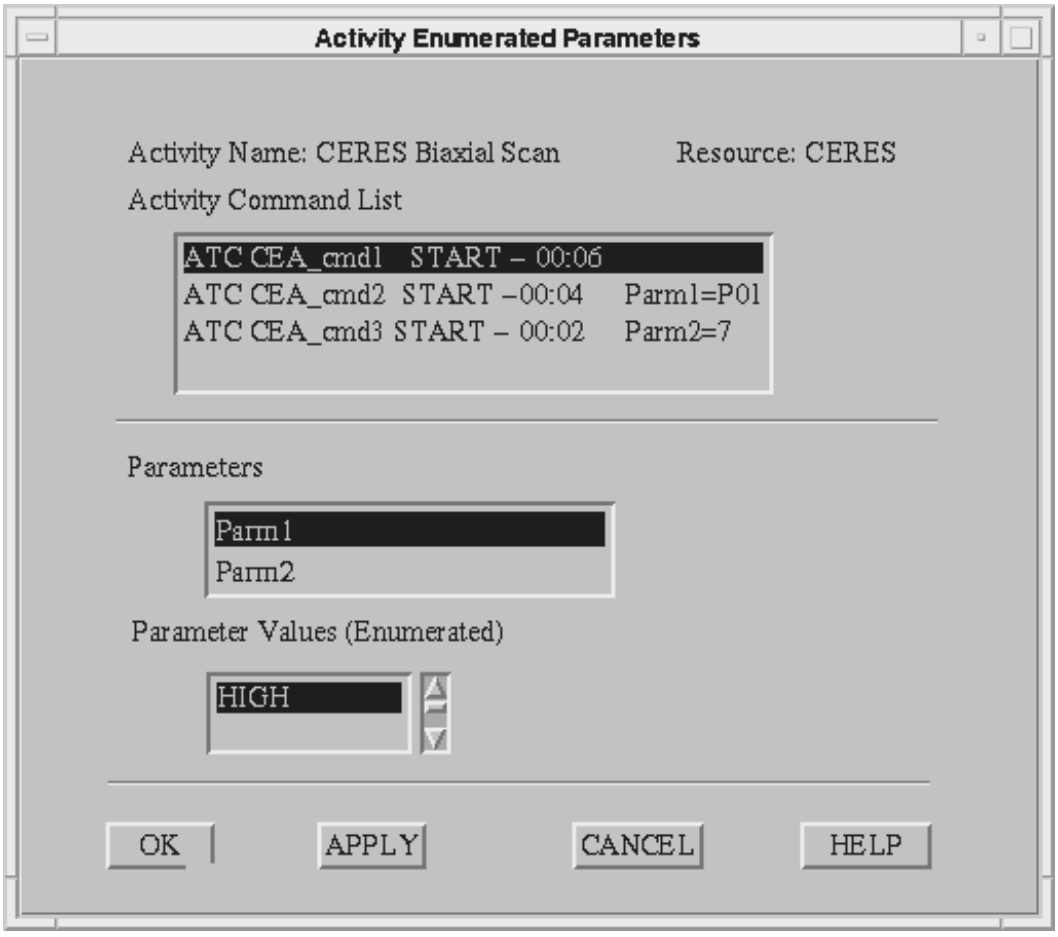

Figure 3.2.5-3. Activity Definer Enumerated Parameters Display

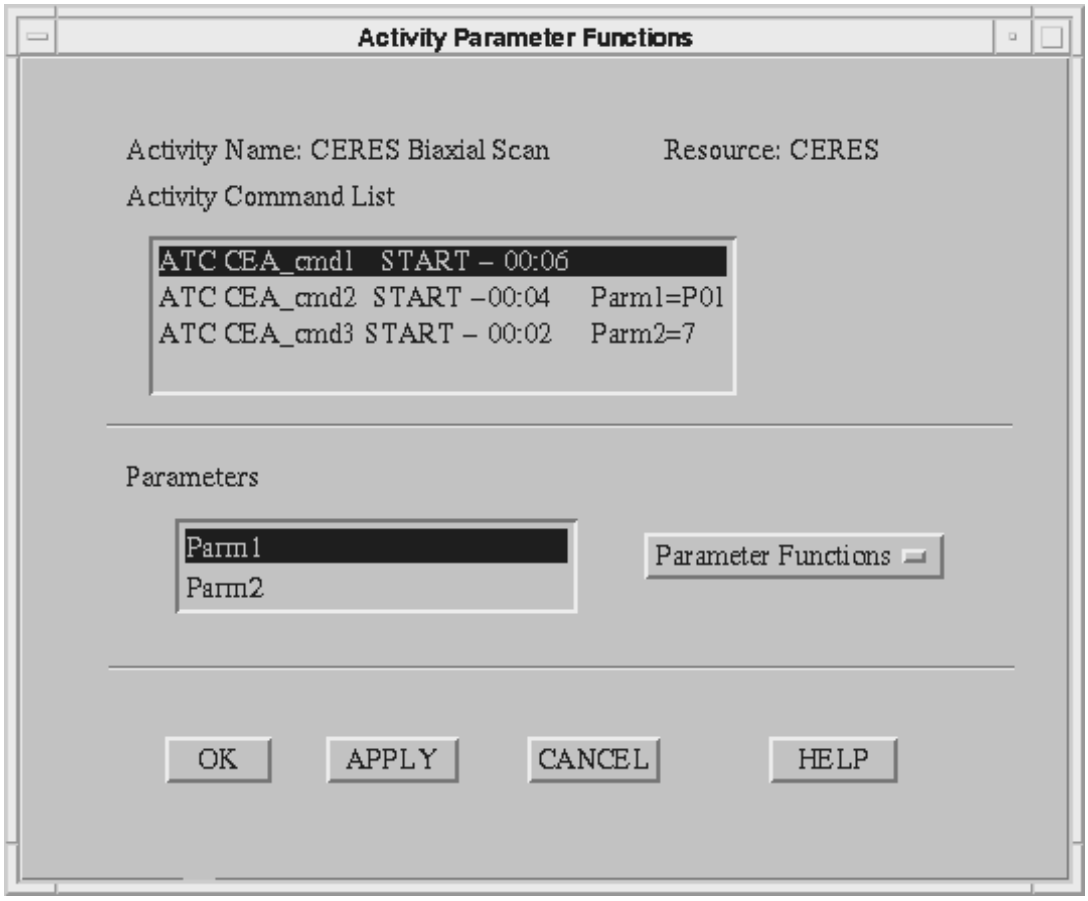

Figure 3.2.5-4. Activity Definer Parameter Functions Display

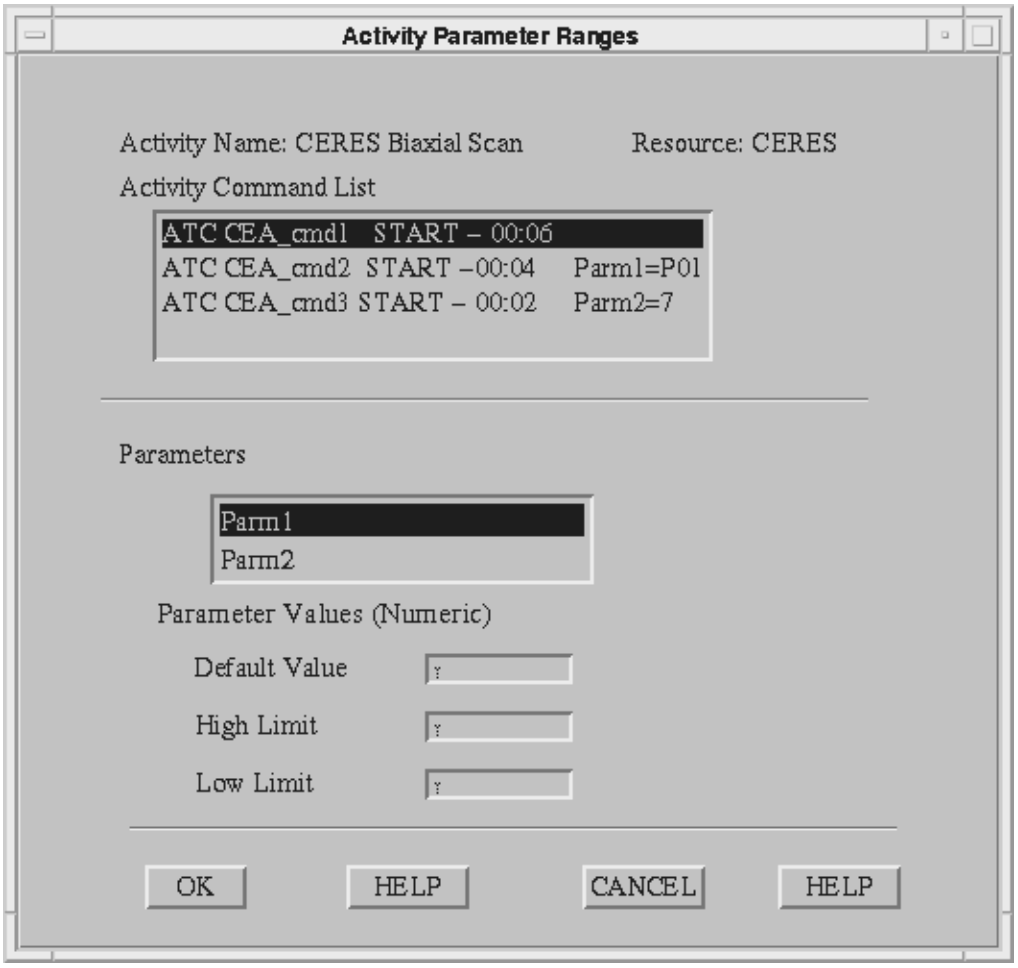

Figure 3.2.5-5. Activity Definer Parameter Range Display

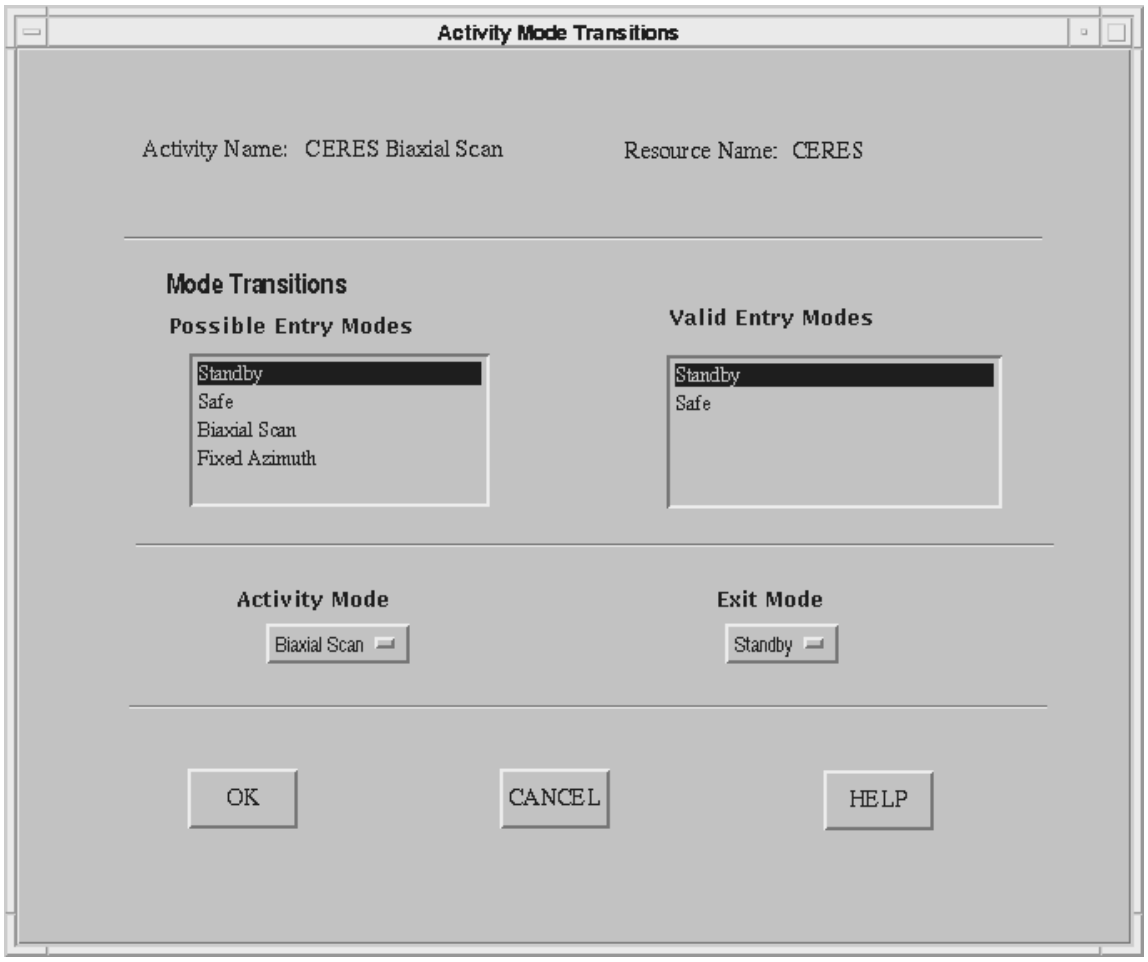

Figure 3.2.5-6. Activity Definer Mode Transitions Display

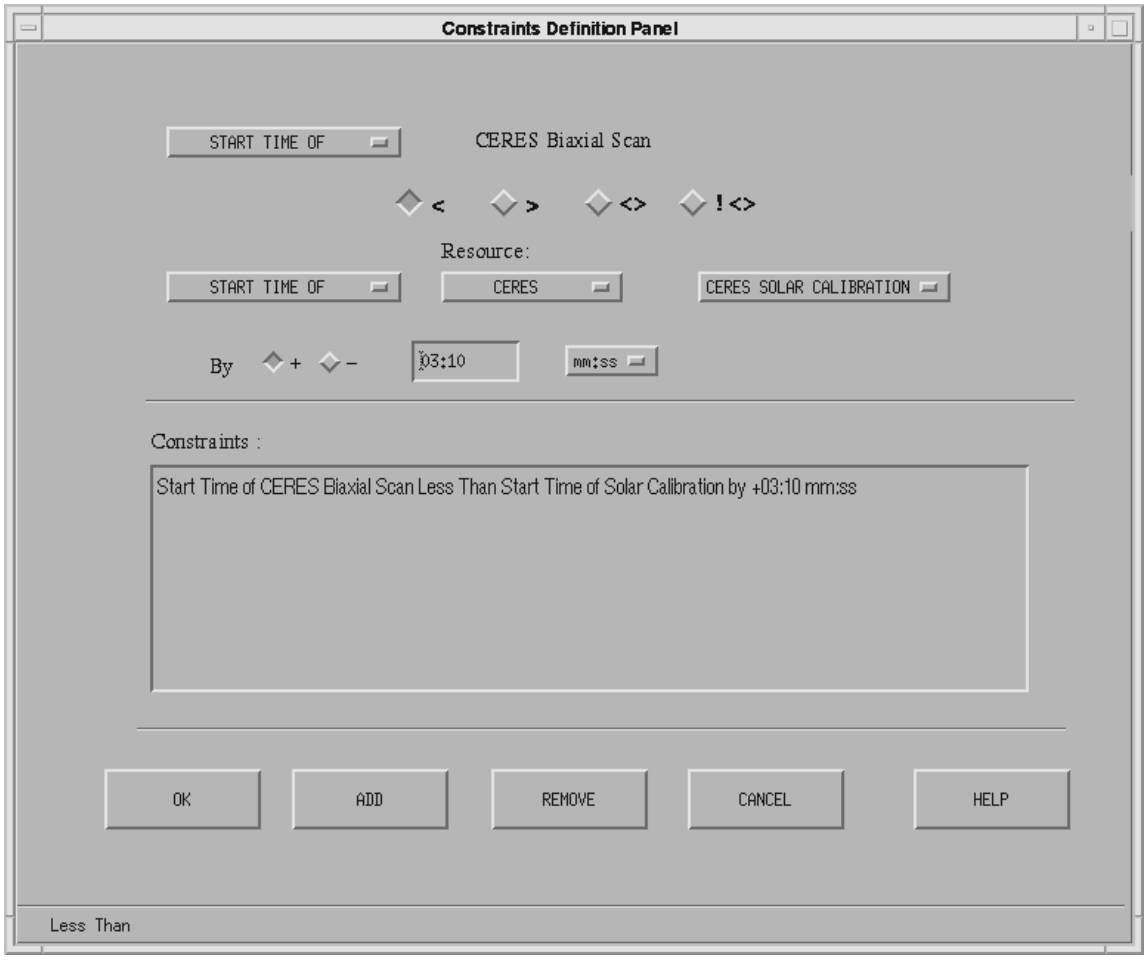

Figure 3.2.5-7. Constraint Definer Display

3.2.5.2 BAP Definer

The BAP definer tool is used by the IOT or the EOC FOT to define a Baseline Activity Profile (BAP) which consists of a number of activities to be scheduled for the instrument's routine operations.

The BAP Definer tool is brought up when the user selects this tool from the options within the "P&S room" provided by FUI. The sample screens for the BAP Definer tool are shown in Figures 3.2.5-8 through 3.2.5-14. The top level screen display shows the summary definition of a BAP as it is developed by the user on other displays. The "File" pull down menu on the top level screen provides the OPEN, NEW, SAVE, SAVE AS, DELETE and QUIT functions, as applicable to BAPs. The "Edit" pull down menu allows the user to bring up screen displays for specifying the activities, parameters, and activity scheduling information. The next level screen display (BAP editor) allows the user to edit an existing BAP or view its contents. On this window, the user can select activities from a list of configured activities for the instrument and add them to the BAP. The user can also rearrange the activities positionally, if required, using the

arrow buttons. Once all activities that make up the BAP are defined, the BAP Scheduling window can be used to specify scheduling information on each activity. The start time of any activity can be specified based on an event and a plus or minus delta time from the event; or it can be specified so that the activity is scheduled based on a frequency (repeat period) from a specific start time. The stop time of the activity can be specified based on an event plus or minus delta, or based on activity duration.

Parameters for activities in the BAP may be specified on the three BAP Parameter displays. These parameter values are used when the each activity in the BAP is scheduled.

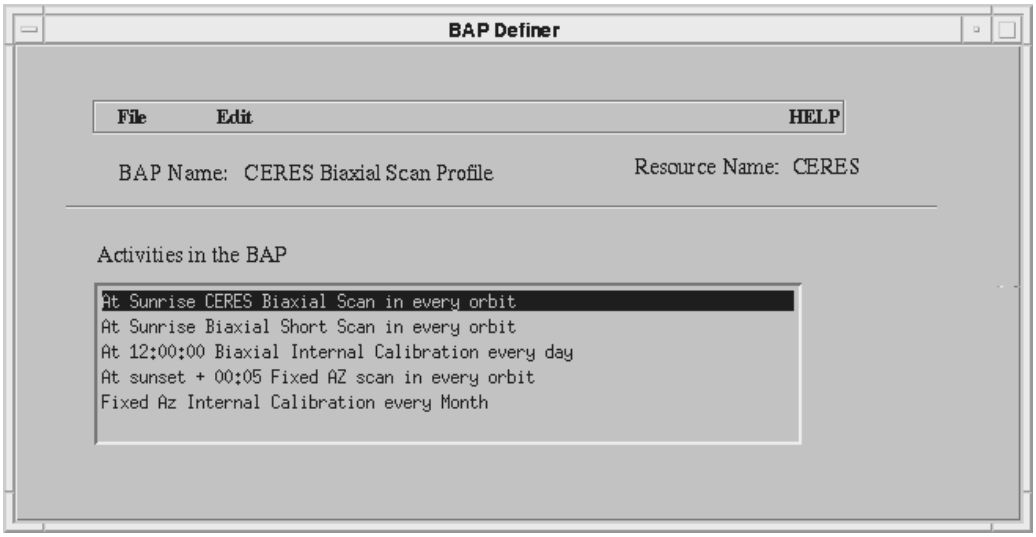

Figure 3.2.5-8. BAP Definer Top Level Display

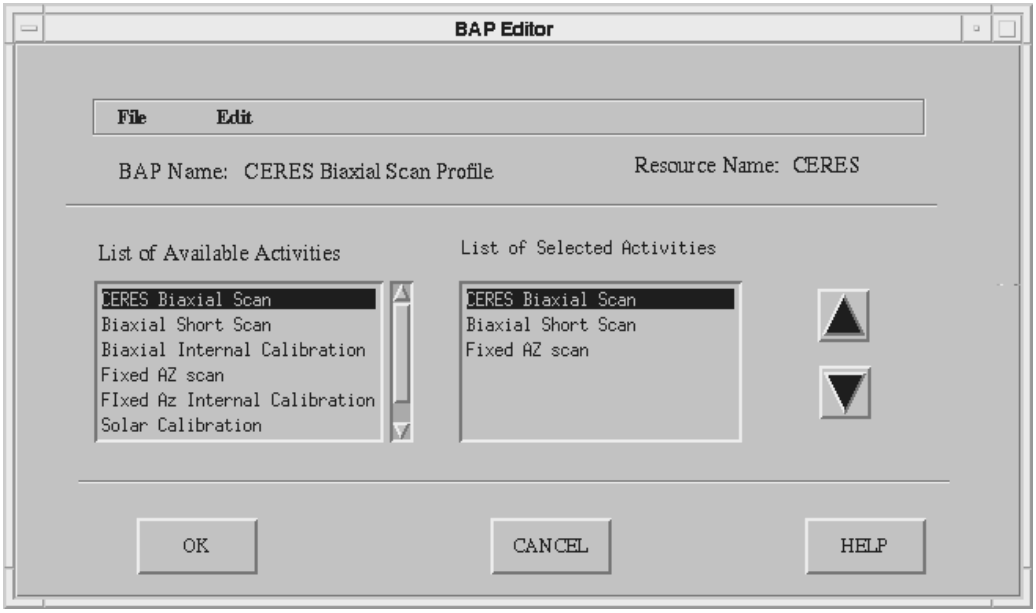

Figure 3.2.5-9. BAP Definer Activity Editor Display

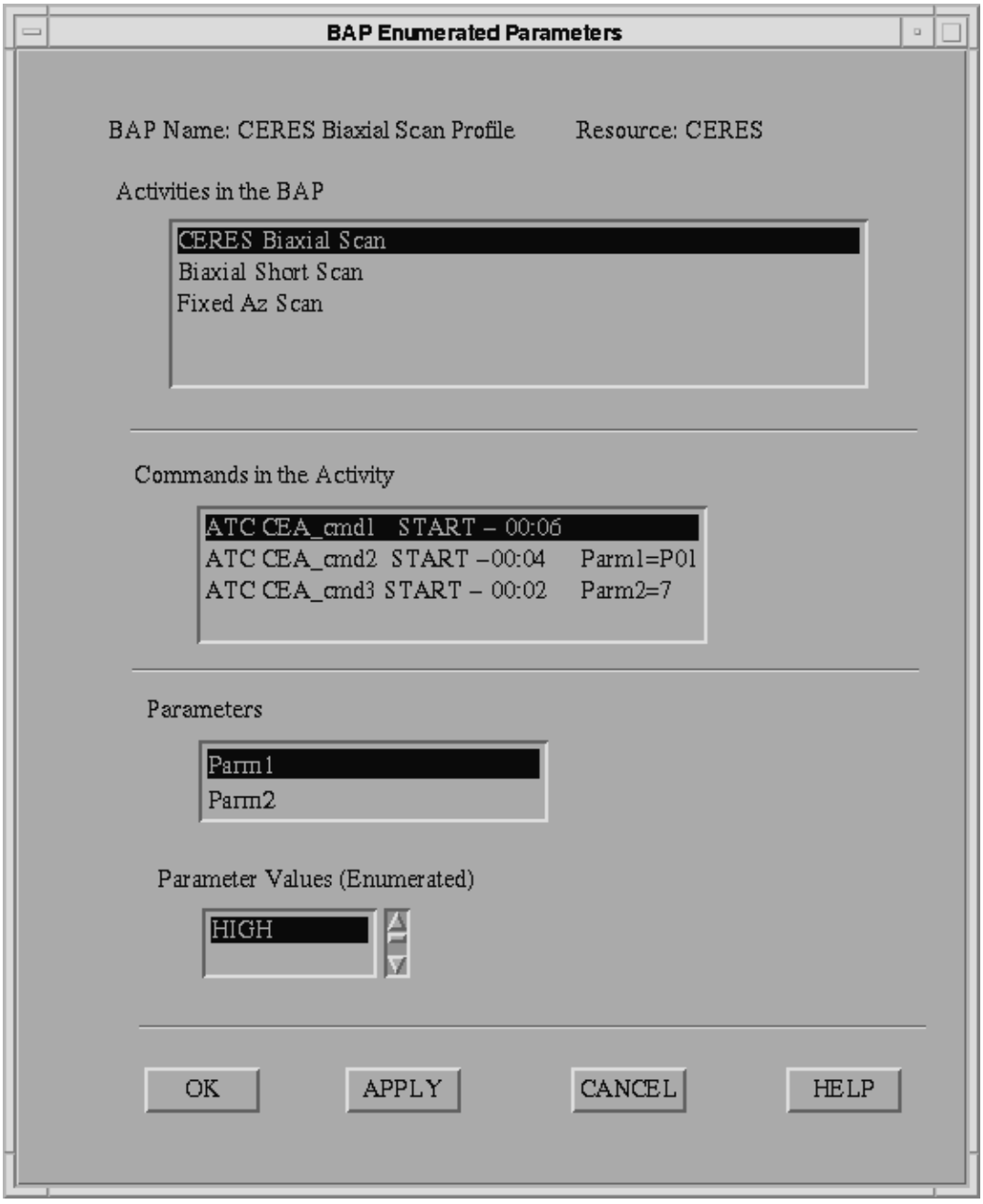

Figure 3.2.5-10. BAP Definer Enumerated Parameters Display

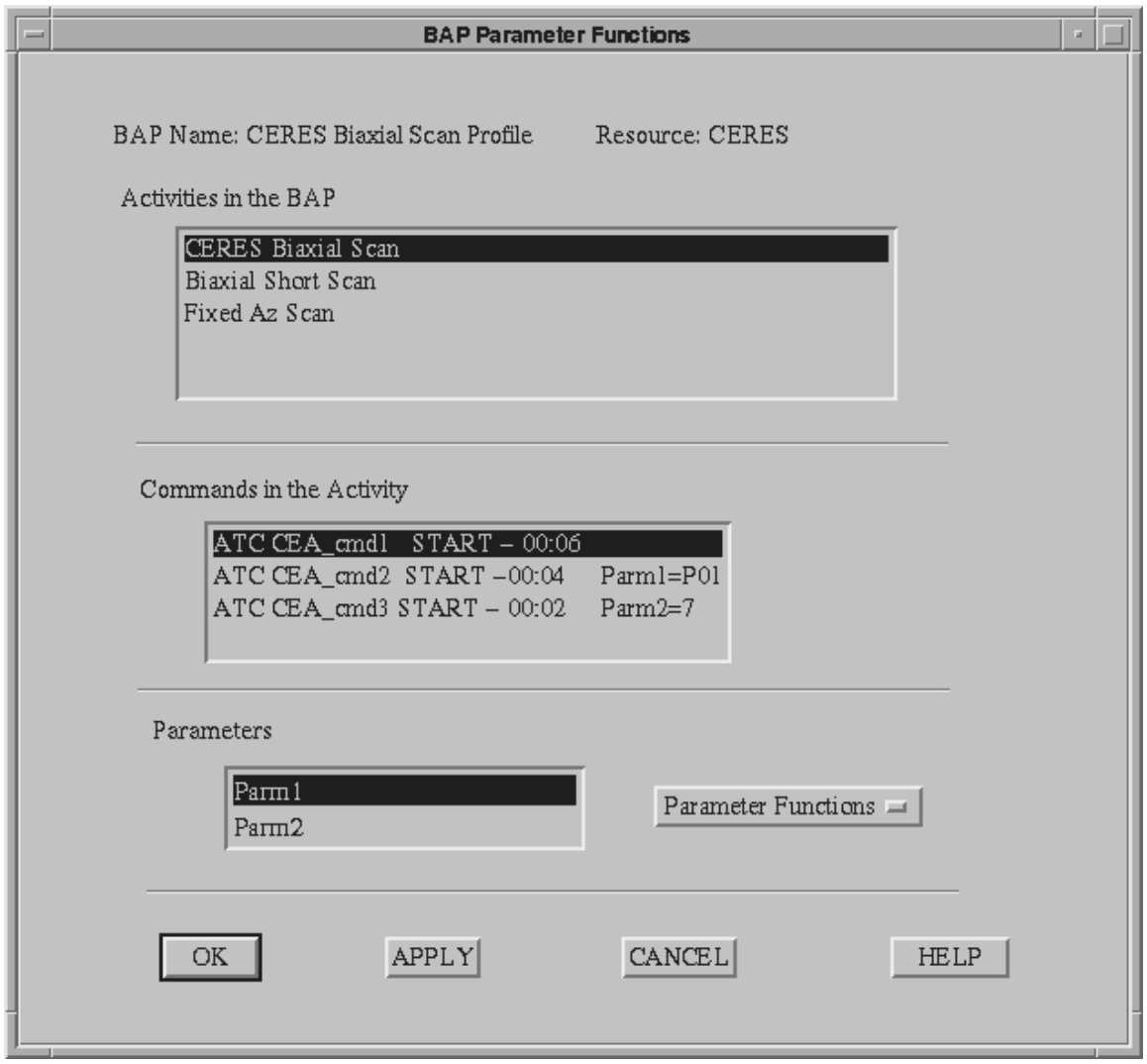

Figure 3.2.5-11. BAP Definer Parameter Functions Display

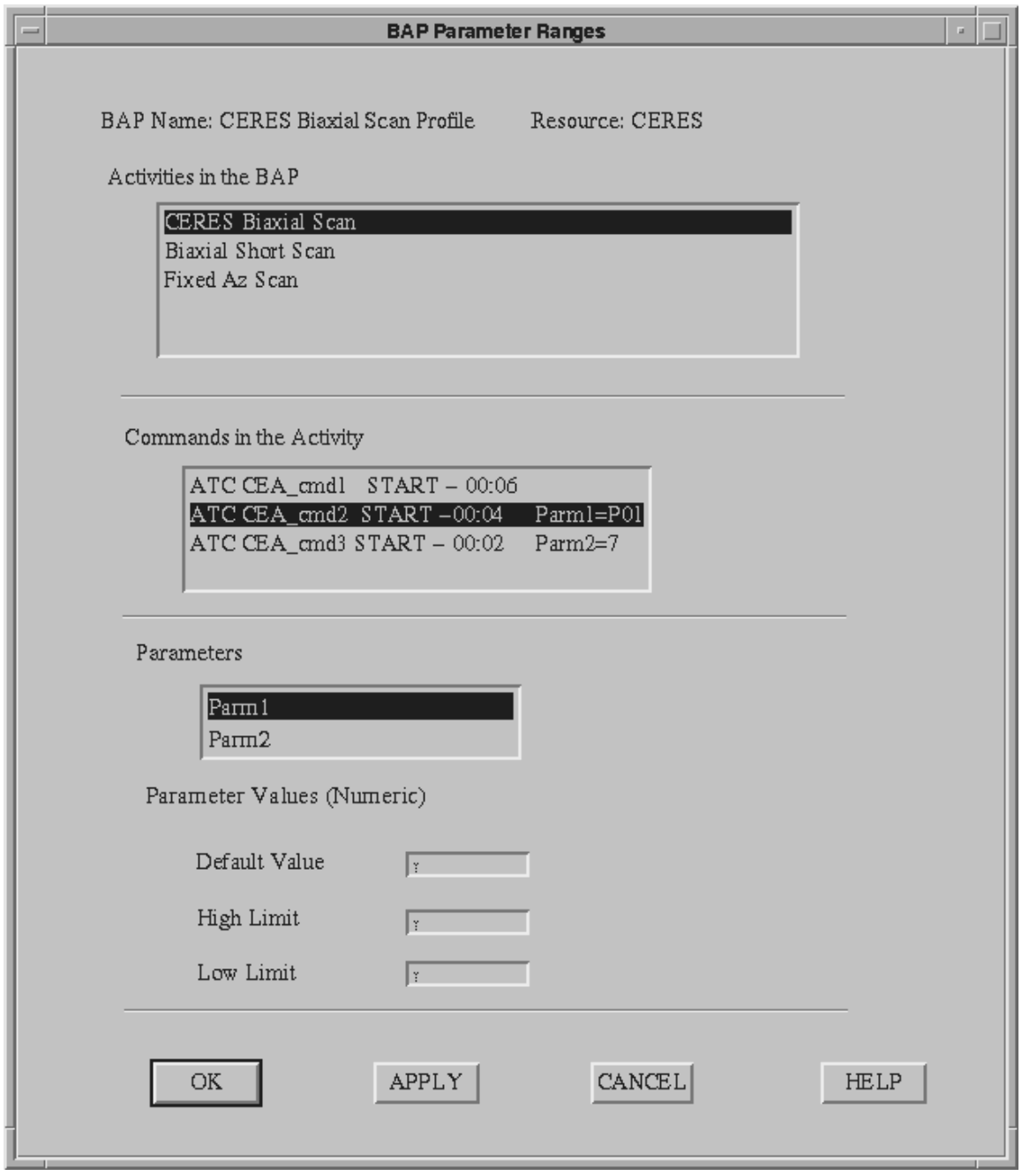

Figure 3.2.5-12. BAP Definer Parameter Range Display

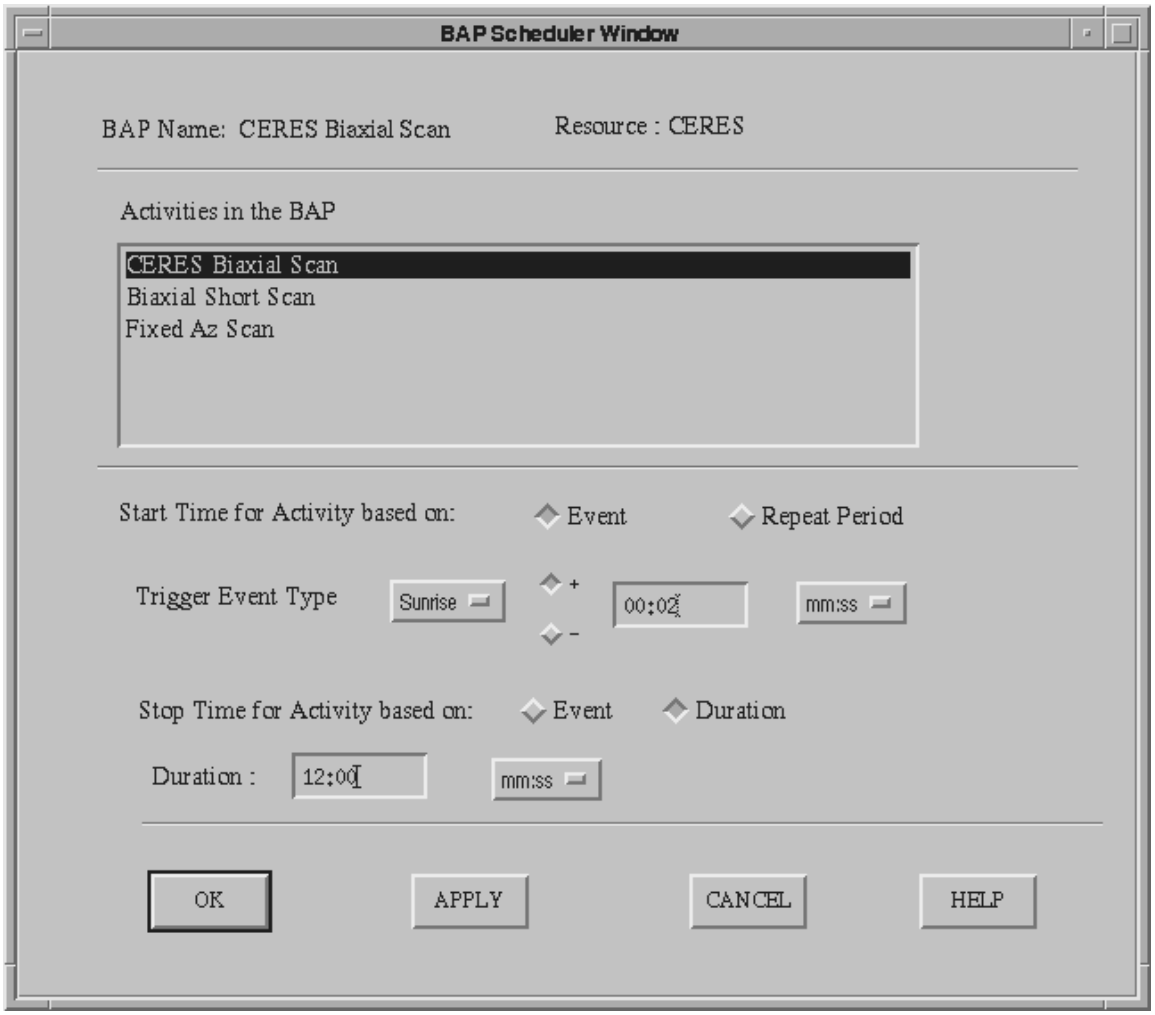

Figure 3.2.5-13. BAP Definer Scheduling Info Display Using Events and Duration

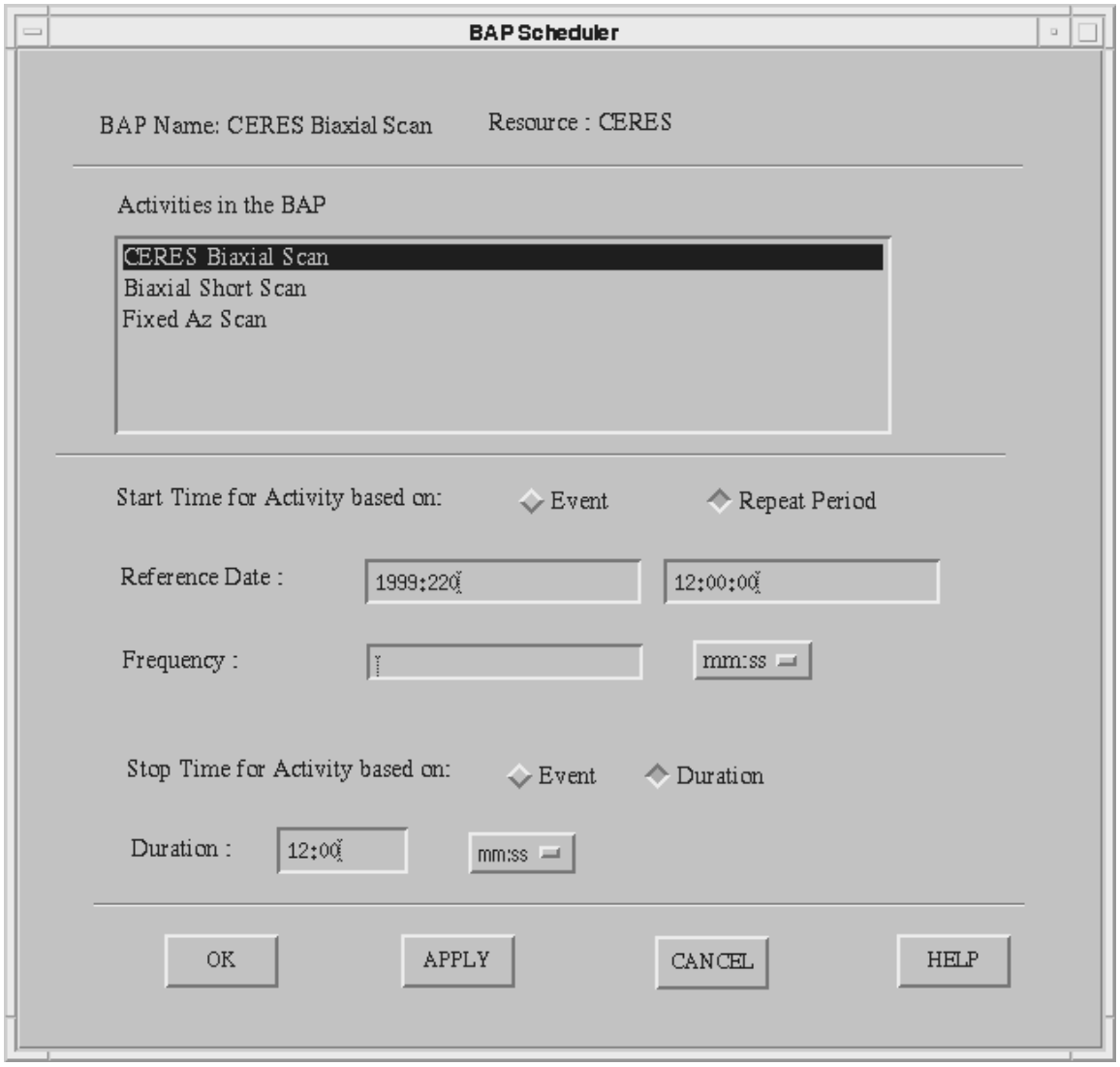

Figure 3.2.5-14. BAP Definer Scheduling Info Display Using Reference Time and Duration

3.2.5.3 Scheduler

The Scheduler tool is used by the IOT or the EOC FOT to schedule an activity, a BAP, or a single command.

The Scheduler tool is brought up when the user selects this tool from the options within the "P&S room" provided by FUI. The sample screens for the Scheduler tool are shown in Figures 3.2.5-15 through 3.2.5-17.

The user can specify the name of the plan (the Master EOC plan or one of the What-if plans) to schedule the BAP, activity or the command. For scheduling a BAP, the user can specify the

scheduling period using the start time and stop time, or the start time and duration. All activities in the BAP are scheduled for this time period based on the event information or repeat period specified for the activity in the BAP definition.

For scheduling an activity, the user can specify the start time based on an event with a delta time or an absolute time. The user may specify the stop time for the activity based on an event with a delta time or an absolute time or duration.

For scheduling a command, the user can specify the start time based on an event with a delta time or an absolute time.. There is no stop time associated with a command.

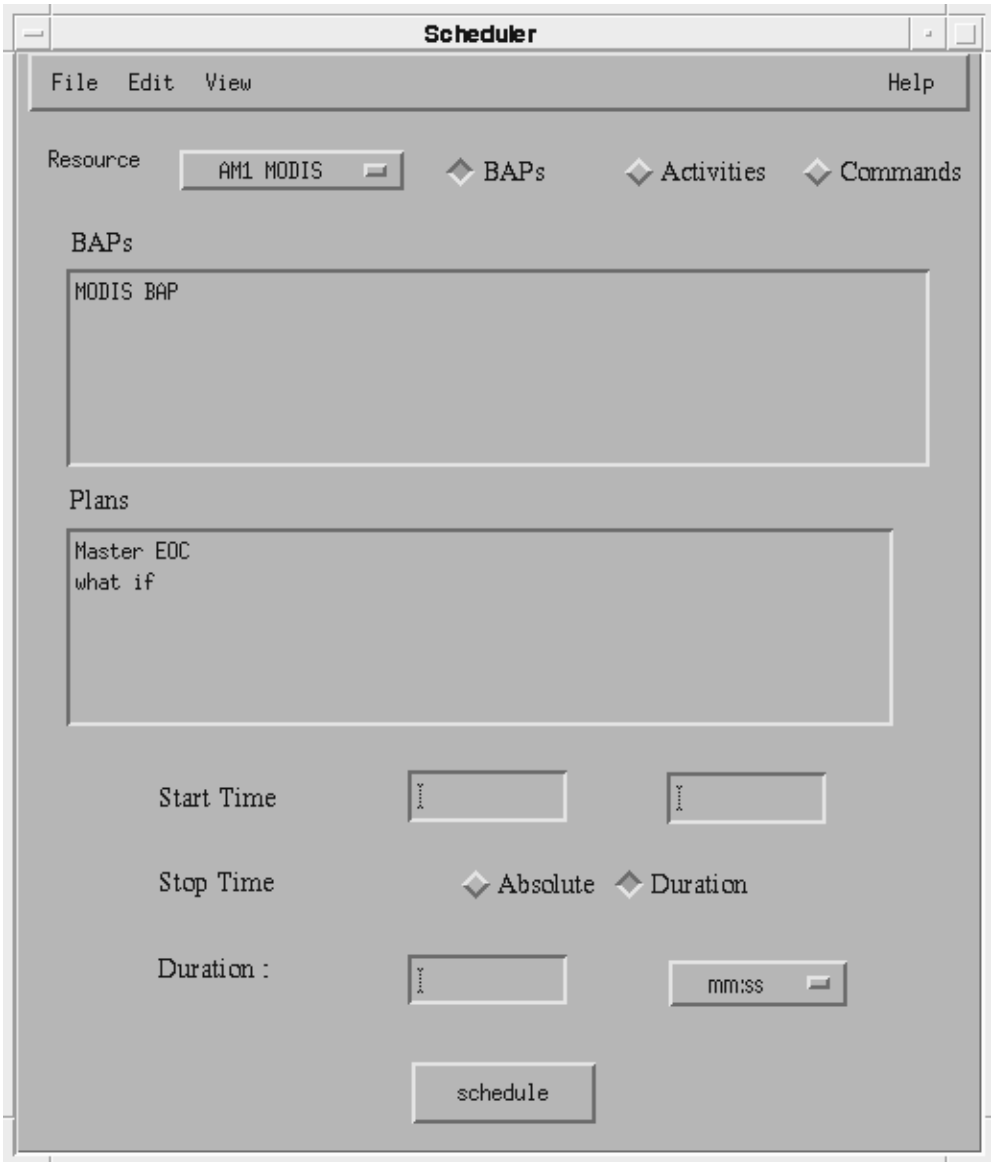

Figure 3.2.5-15. Scheduler Display: BAP Scheduling

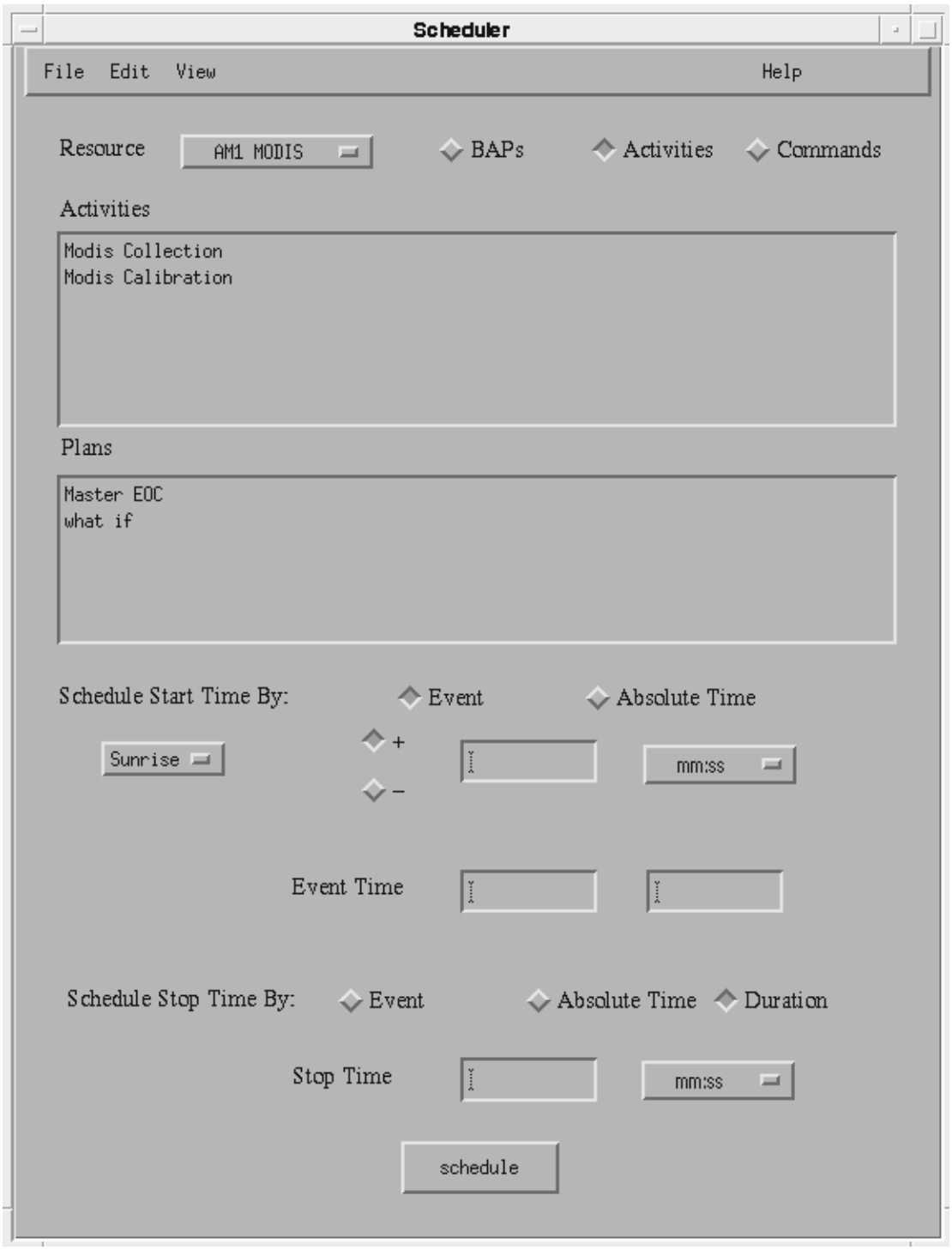

Figure 3.2.5-16. Scheduler Display : Activity Scheduling

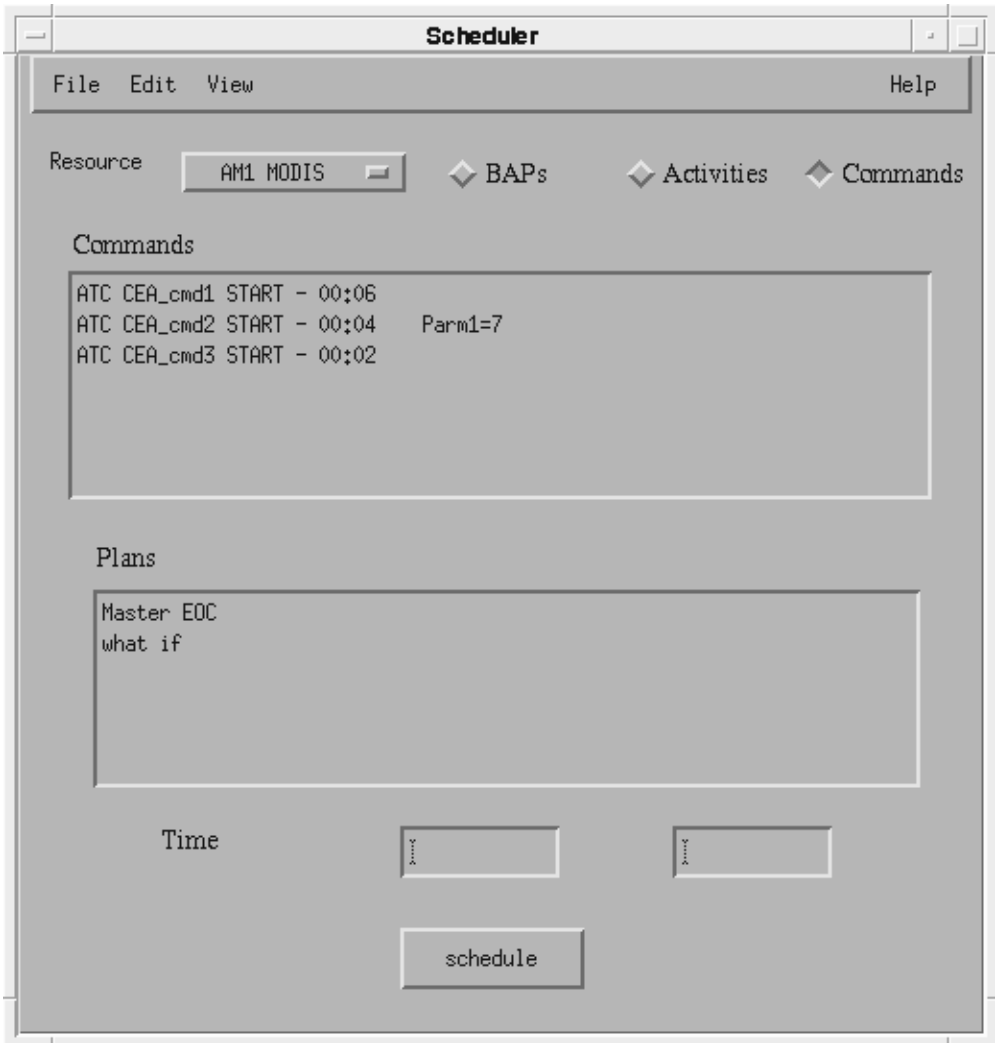

Figure 3.2.5-17. Scheduler Display : Command Scheduling

3.2.5.4 Plan Tool

The Plan tool is used by the IOT or the EOC FOT to establish accesses, permissions or locks on plans maintained by the P&S. These include the Master EOC plan or one of the what-if plans defined by the users.

The Plan tool is brought up when the user selects this tool from the options within the "P&S room" provided by FUI. The sample screens for the Plan tool are shown in Figures 3.2.5-18 through 3.2.5-20. The "File" pull down menu on the top level screen provides the NEW, OPEN, CLOSE, COPY, SAVE, SAVEAS, DELETE, PRINT and QUIT functions, applicable to plans. The "Edit" pull down menu allows the user to specify plan permissions, locks and time range updates.

The plan tool allows the user-group to select a plan and set permissions and/or locks on them at the resource level. When one user-group has set an access on a resource for a time period on a given plan, any other user-group may not concurrently schedule on the same resource. This allows plan integrity, and enforces user coordination on use of plans.

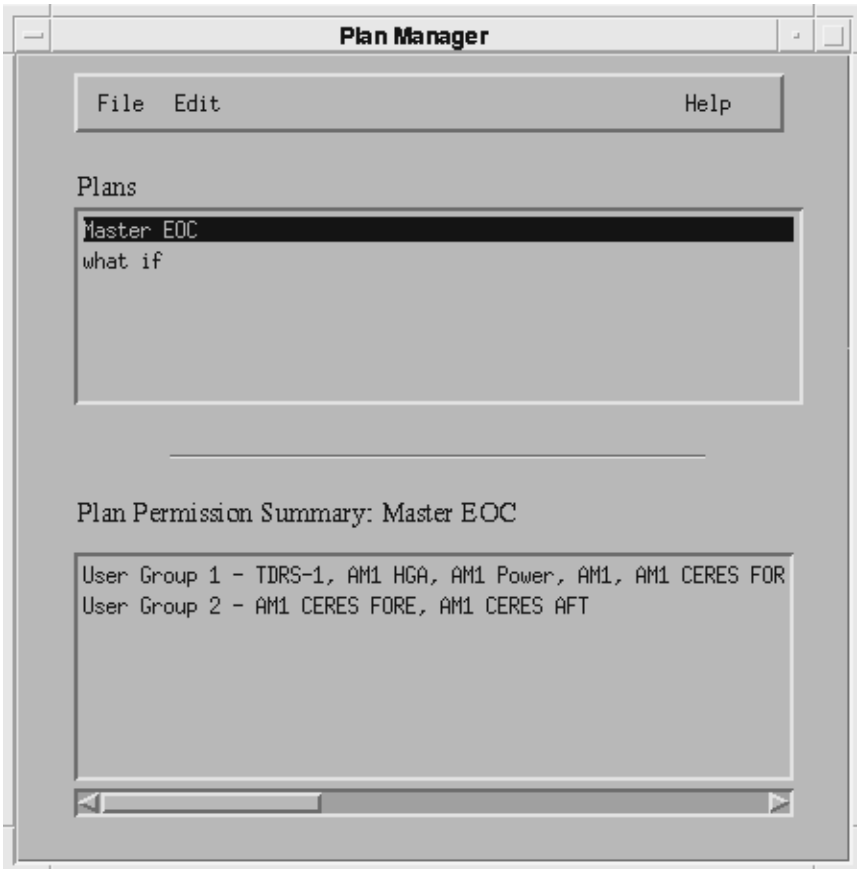

Figure 3.2.5-18. Plan Tool Top Level Display

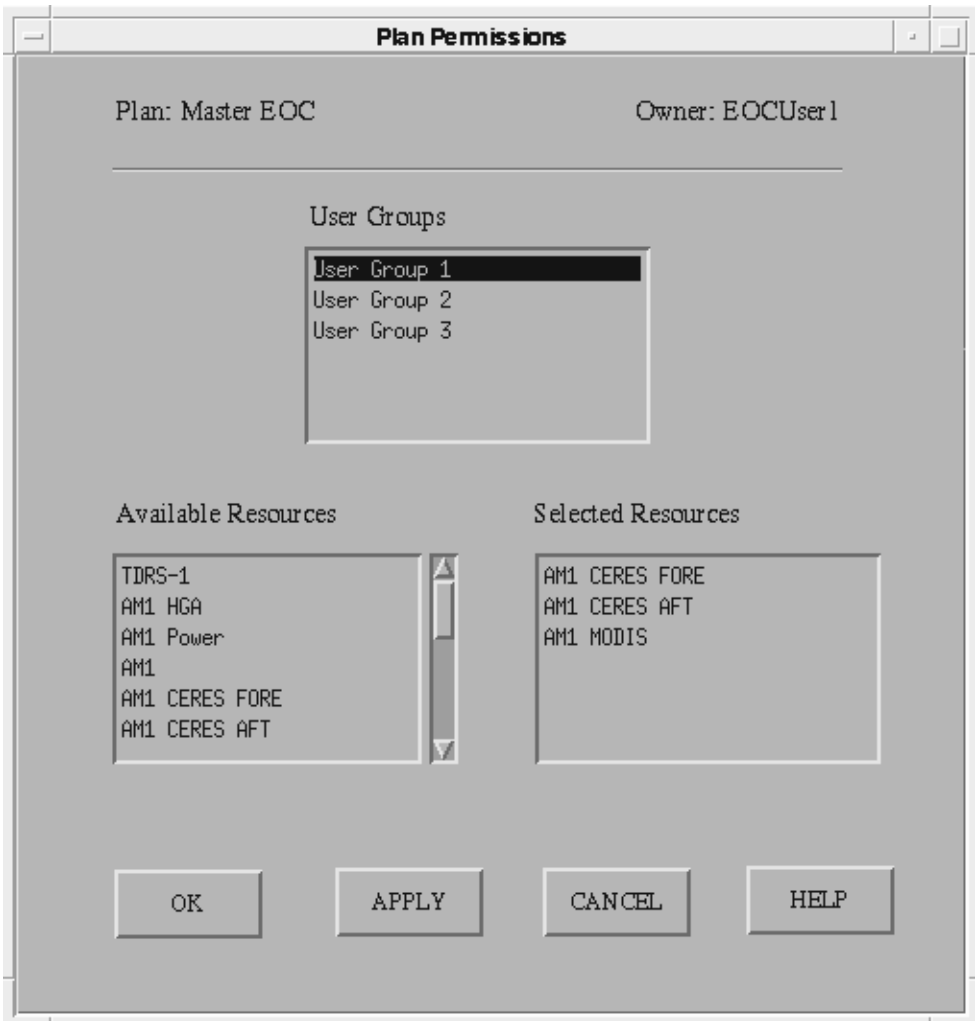

Figure 3.2.5-19. Plan Tool Permissions Display

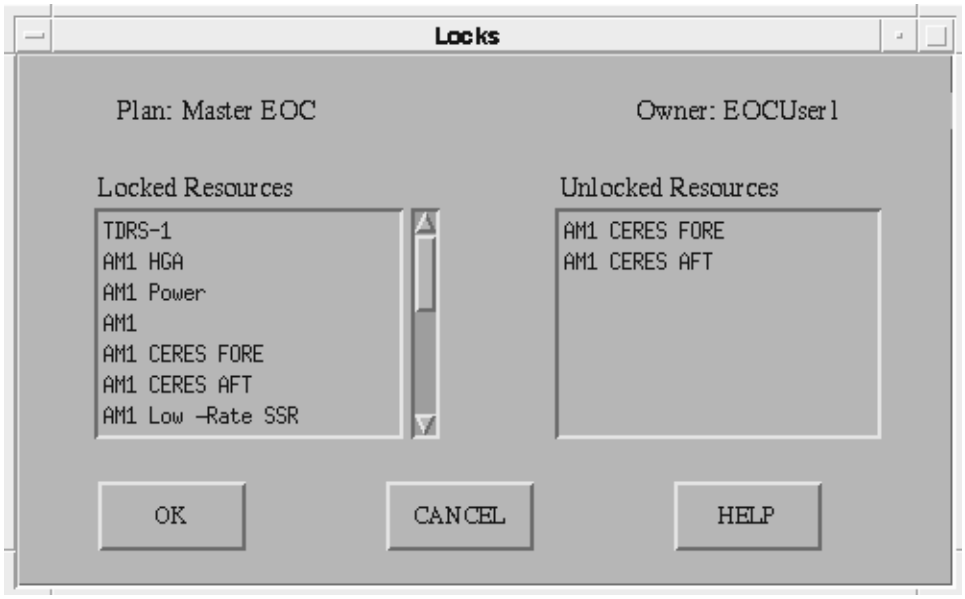

Figure 3.2.5-20. Plan Tool Locks Display

3.2.5.5 Timeline

The Timeline tool is used by the IOT or the EOC FOT to view activities, orbit events, constraints and accesses on a given plan for a given time interval.

The Timeline tool is brought up when the user selects this tool from the options provided in the "P&S room" provided by FUI. The sample Timeline is shown in Figure 3.2.5-21.

The Timeline tool allows the user to scroll by time and by resource in order to view portions of both the master plan or any "what-if" plans. In addition, the Timeline's view is highly configurable in that a user may add and remove resources from the view, modify the colors of the displayed activities, and filter out those activities, events, and constraints that the user wishes to view.

Certain scheduling functions may also be performed through the timeline. Activities may be modified by selecting them and using the "Edit" pull down menu to spawn the Activity Scheduler tool. Activities may also be removed from the schedule. Access to write to portions of a plan can also be viewed and modified from the timeline. Toggle buttons are provided on the timeline to allow users to select those resources that they wish to obtain write access. Finally, users can acquire a hard copy printout of the timeline for schedule analysis.

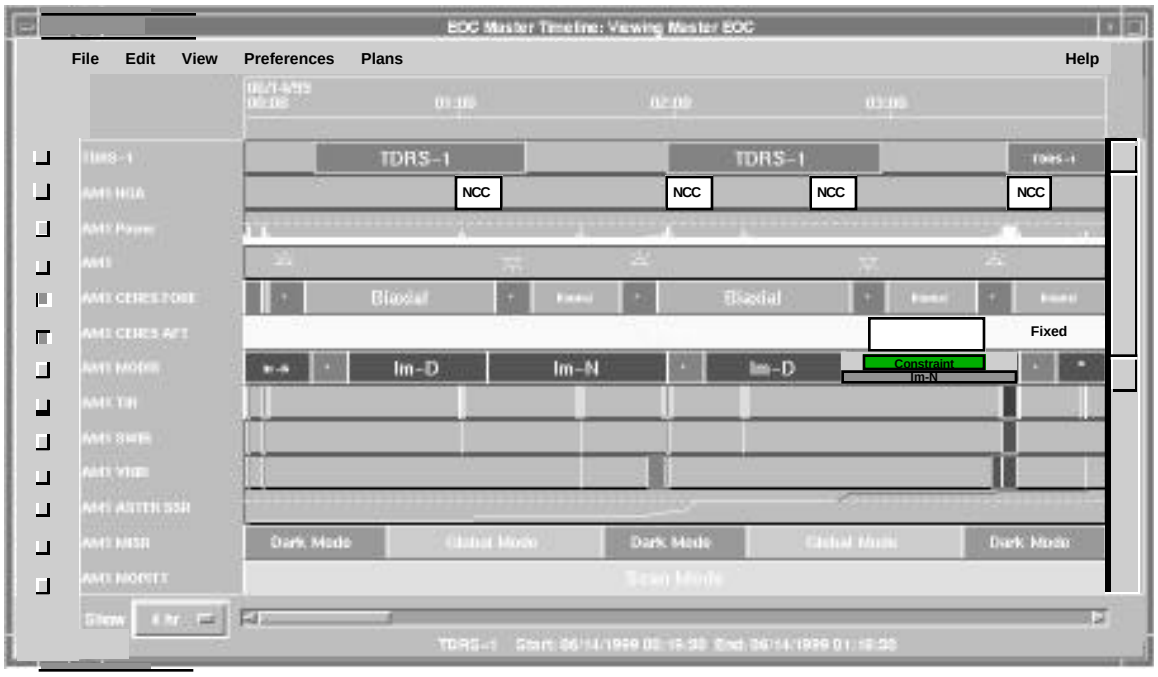

Figure 3.2.5-21. Timeline Display

3.3 Command Management

FOS Command Management provides for the generation and maintenance of command and memory loads. FOS tools that may be used to generate and maintain loads are available at the IST. These tools may be used to create or edit RTS load contents files; to create or edit table load contents files; to transfer load contents files from an SCF directory to an FOS directory; to generate RTS, table, or microprocessor loads in uplink format and enter them in the FOS Load Catalog; to request the scheduling of the uplink of an RTS, table, or microprocessor load, and to view the list of loads currently available in the FOS Load Catalog. The load generation and maintenance functions are initiated from the Load Manager tool, shown in Figure 3.3-1. The functions are initiated by buttons on the Load Manager window as follows:

CATALOG SEARCH - Initiate listing of available loads via the Catalog Search window

EDIT - Initiate building or editing of RTS or table load contents via Load Editor window

LOAD INGEST - Initiate transferring of load contents to FOS via Load Ingest window

VALIDATE - Initiate validation of RTS load contents

GENERATE - Initiate generation of load from load contents via the Load Generator window

SCHEDULE - Initiate scheduling of the uplink of a load via the Load Scheduler window

DELETE - Initiate the deletion of the load specified in the Load Selection box on the Load Manager window

In addition to load management functions, FOS Command Management provides for processing of memory dump data. Instrument memory dump data may be displayed in hex as a report, compared to an instrument load, or exported from the FOS to the SCF. These memory dump processing functions may be initiated from the IST.

FOS Command Management also provides operational reports documenting load generation and uplink functions. All operational reports related to load generation and uplink are available at the IST.

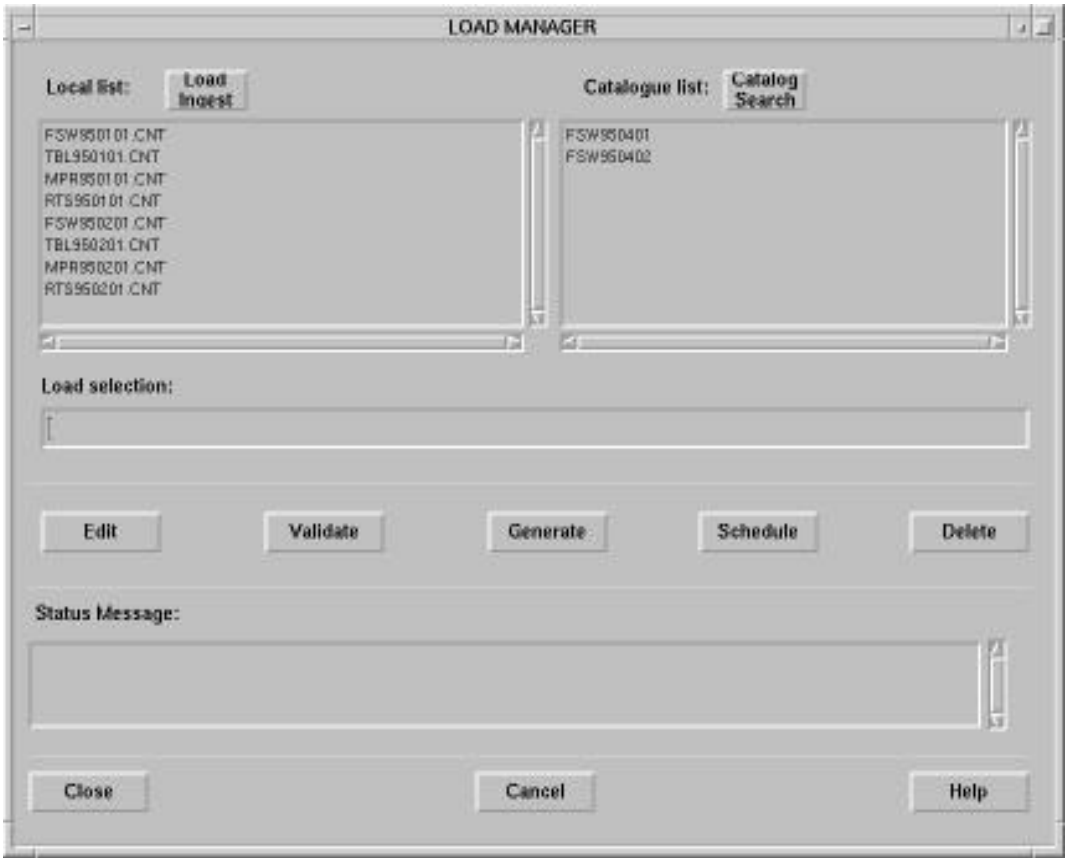

Figure 3.3-1. Load Manager